



Full wwPDB Geometry-Only Validation Report ⓘ

Mar 1, 2026 – 06:13 AM UTC

PDB ID : 1LZN / pdb_00001lzn
Title : NEUTRON STRUCTURE OF HEN EGG-WHITE LYSOZYME
Authors : Bon, C.I.; Lehmann, M.S.; Wilkinson, C.
Deposited on : 1999-03-23
Resolution : 1.70 Å(reported)

This is a Full wwPDB Geometry-Only Validation Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4-5-2 with Phenix2.0
Mogul : 2022.3.0, CSD as543be (2022)
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

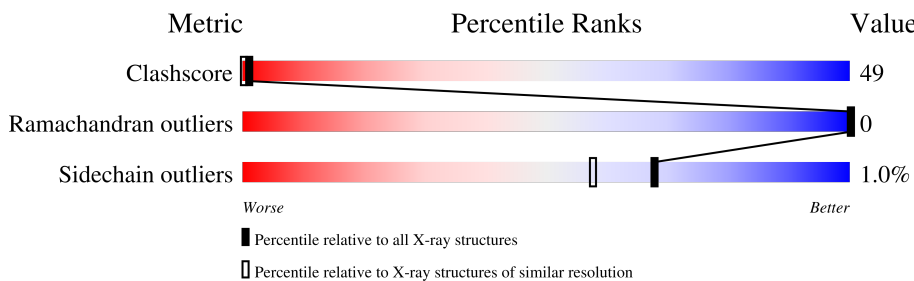
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

NEUTRON DIFFRACTION

The reported resolution of this entry is 1.70 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
Clashscore	190562	5924 (1.70-1.70)
Ramachandran outliers	187476	5846 (1.70-1.70)
Sidechain outliers	187428	5846 (1.70-1.70)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	129	

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
2	NO3	A	1151	-	-	X	-

2 Entry composition [i](#)

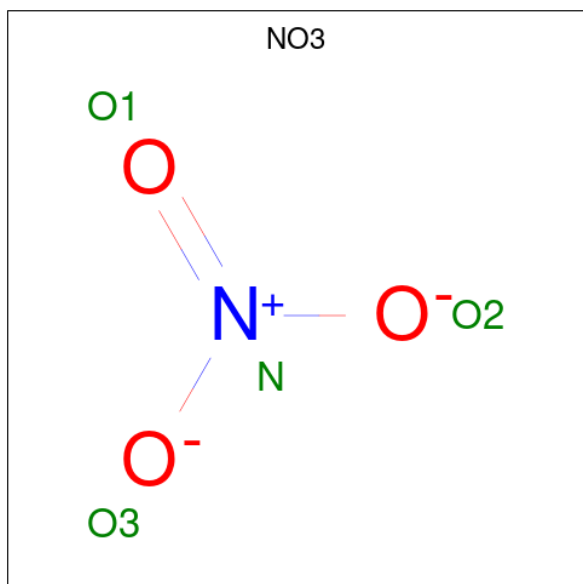
There are 4 unique types of molecules in this entry. The entry contains 2457 atoms, of which 695 are hydrogens and 497 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a protein called PROTEIN (LYSOZYME).

Mol	Chain	Residues	Atoms							ZeroOcc	AltConf	Trace
1	A	129	Total	C	D	H	N	O	S	54	0	0
			1963	613	267	695	193	185	10			

- Molecule 2 is NITRATE ION (CCD ID: NO3) (formula: NO₃).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	N	O	0	0
			4	1	3		
2	A	1	Total	N	O	0	0
			4	1	3		
2	A	1	Total	N	O	0	0
			4	1	3		
2	A	1	Total	N	O	0	0
			4	1	3		

- Molecule 3 is SODIUM ION (CCD ID: NA) (formula: Na).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	1	Total 1	Na 1	0	0

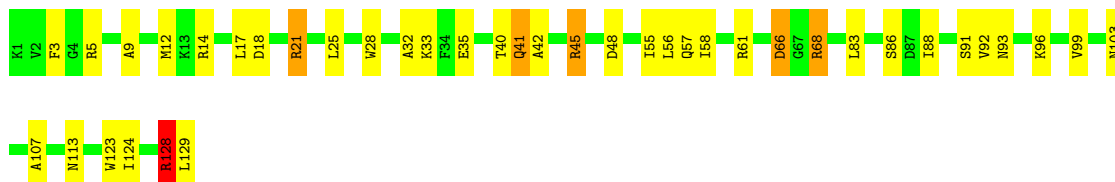
- Molecule 4 is water.

Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	243	Total 473	D 230	O 243	0	0

i

Note EDS was not executed.

Chain A: 69% 26% 5%



4 Model quality ⓘ

4.1 Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: NO3, DOD, NA

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	$\# Z > 5$	RMSZ	$\# Z > 5$
1	A	1.13	4/1021 (0.4%)	1.87	21/1379 (1.5%)

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	45	ARG	CZ-NH2	7.81	1.43	1.33
1	A	45	ARG	CG-CD	-7.60	1.29	1.52
1	A	35	GLU	CD-OE1	5.80	1.30	1.19
1	A	35	GLU	CD-OE2	-5.50	1.22	1.33

All (21) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	128	ARG	CD-NE-CZ	33.99	171.99	124.40
1	A	41	GLN	OE1-CD-NE2	-14.02	108.58	122.60
1	A	45	ARG	CD-NE-CZ	13.30	143.02	124.40
1	A	103	ASN	CA-C-N	-11.72	109.66	122.55
1	A	103	ASN	C-N-CA	-11.72	109.66	122.55
1	A	45	ARG	NE-CZ-NH2	9.82	128.04	119.20
1	A	99	VAL	O-C-N	-8.88	111.77	121.80
1	A	68	ARG	CD-NE-CZ	8.68	136.55	124.40
1	A	45	ARG	CB-CG-CD	7.17	127.79	111.30
1	A	14	ARG	NE-CZ-NH1	-7.13	114.37	121.50
1	A	103	ASN	CA-CB-CG	-6.74	105.86	112.60
1	A	128	ARG	O-C-N	-6.62	114.88	123.02
1	A	14	ARG	NH1-CZ-NH2	6.61	127.89	119.30
1	A	128	ARG	CA-C-N	-6.55	109.90	121.70
1	A	128	ARG	C-N-CA	-6.55	109.90	121.70
1	A	61	ARG	CD-NE-CZ	6.03	132.85	124.40
1	A	21	ARG	NE-CZ-NH2	5.69	124.32	119.20

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	99	VAL	CA-C-O	5.51	126.42	120.47
1	A	48	ASP	CA-C-O	5.43	125.85	119.28
1	A	113	ASN	OD1-CG-ND2	-5.22	117.38	122.60
1	A	66	ASP	CA-CB-CG	5.06	117.66	112.60

There are no chirality outliers.

There are no planarity outliers.

4.2 Too-close contacts

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	1268	695	959	97	0
2	A	20	0	0	3	0
3	A	1	0	0	0	0
4	A	473	0	0	96	0
All	All	1762	695	959	98	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 49.

All (98) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:40:THR:CG2	4:A:1417:HOH:O	1.75	1.30
1:A:129:LEU:CD2	4:A:1485:HOH:O	1.91	1.16
1:A:32:ALA:HB2	4:A:2081:HOH:O	1.40	1.13
1:A:124:ILE:HG21	4:A:2022:HOH:O	1.41	1.13
1:A:40:THR:HG22	4:A:1417:HOH:O	1.32	1.10
1:A:25:LEU:HD13	4:A:2023:HOH:O	1.47	1.09
1:A:91:SER:CB	4:A:1474:HOH:O	2.00	1.08
1:A:129:LEU:HD21	4:A:1485:HOH:O	1.44	1.07
1:A:3:PHE:CE1	4:A:1486:HOH:O	2.09	1.05
1:A:58:ILE:CD1	4:A:1418:HOH:O	2.06	1.02
1:A:128:ARG:HD2	4:A:1234:DOD:O	1.55	1.01
1:A:91:SER:C	4:A:1412:DOD:O	2.07	0.96

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:A:1151:NO3:O2	4:A:1235:HOH:O	1.83	0.96
1:A:25:LEU:CG	4:A:2022:HOH:O	2.13	0.94
1:A:25:LEU:HB3	4:A:2022:HOH:O	1.62	0.92
1:A:83:LEU:HD13	4:A:2041:HOH:O	1.63	0.91
1:A:83:LEU:HD22	4:A:2041:HOH:O	1.66	0.91
1:A:93:ASN:OD1	4:A:1483:DOD:O	1.86	0.90
1:A:9:ALA:HB1	4:A:1389:HOH:O	1.66	0.89
1:A:21:ARG:HD3	4:A:1311:DOD:O	1.67	0.87
1:A:129:LEU:CG	4:A:2018:HOH:O	2.21	0.87
1:A:58:ILE:HD12	4:A:1418:HOH:O	1.66	0.87
1:A:91:SER:HB2	4:A:1474:HOH:O	1.58	0.86
1:A:129:LEU:CD1	4:A:2018:HOH:O	2.23	0.86
1:A:40:THR:CG2	4:A:1486:HOH:O	2.23	0.86
1:A:107:ALA:HB1	4:A:1411:HOH:O	1.70	0.85
1:A:92:VAL:N	4:A:1412:DOD:O	2.10	0.83
1:A:32:ALA:CB	4:A:2081:HOH:O	2.14	0.83
1:A:129:LEU:HD12	4:A:2018:HOH:O	1.72	0.81
1:A:57:GLN:O	4:A:1273:DOD:O	1.98	0.81
1:A:9:ALA:C	4:A:1485:HOH:O	2.22	0.81
1:A:25:LEU:CB	4:A:2022:HOH:O	2.19	0.81
1:A:91:SER:HA	4:A:1418:HOH:O	1.76	0.79
1:A:56:LEU:HD12	4:A:2036:HOH:O	1.78	0.78
1:A:128:ARG:CD	4:A:1234:DOD:O	2.23	0.77
1:A:129:LEU:HG	4:A:2018:HOH:O	1.77	0.77
1:A:33:LYS:NZ	4:A:1444:HOH:O	2.18	0.76
1:A:9:ALA:HB1	4:A:1485:HOH:O	1.78	0.76
1:A:55:ILE:CG2	4:A:1474:HOH:O	2.34	0.76
1:A:42:ALA:HB1	4:A:1287:DOD:O	1.81	0.76
1:A:91:SER:HB3	4:A:2036:HOH:O	1.82	0.74
1:A:86:SER:HB3	4:A:1236:HOH:O	1.82	0.73
1:A:12:MET:CE	4:A:2081:HOH:O	2.37	0.73
1:A:25:LEU:HD23	4:A:2022:HOH:O	1.82	0.73
1:A:3:PHE:CE1	4:A:1417:HOH:O	2.42	0.72
1:A:9:ALA:CB	4:A:1485:HOH:O	2.37	0.71
1:A:45:ARG:HD2	4:A:1149:DOD:O	1.84	0.71
1:A:55:ILE:HG22	4:A:1474:HOH:O	1.85	0.70
1:A:40:THR:HG21	4:A:1486:HOH:O	1.85	0.69
1:A:25:LEU:CD2	4:A:2022:HOH:O	2.34	0.69
1:A:56:LEU:HB2	4:A:2036:HOH:O	1.87	0.69
1:A:56:LEU:HD22	4:A:2077:HOH:O	1.87	0.69
1:A:17:LEU:HD12	4:A:2080:HOH:O	1.87	0.68

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:92:VAL:CA	4:A:1412:DOD:O	2.42	0.67
1:A:3:PHE:HE1	4:A:1486:HOH:O	1.55	0.67
1:A:96:LYS:HB2	4:A:1428:HOH:O	1.89	0.66
1:A:12:MET:HE1	4:A:2081:HOH:O	1.89	0.65
1:A:18:ASP:HB2	4:A:2023:HOH:O	1.90	0.65
1:A:88:ILE:N	2:A:1151:NO3:O1	2.29	0.65
1:A:96:LYS:CB	4:A:1428:HOH:O	2.44	0.65
1:A:41:GLN:OE1	4:A:2103:DOD:O	2.15	0.64
1:A:56:LEU:CD2	4:A:2077:HOH:O	2.46	0.64
1:A:83:LEU:CD1	4:A:2041:HOH:O	2.34	0.64
1:A:91:SER:CA	4:A:1418:HOH:O	2.42	0.64
1:A:92:VAL:HA	4:A:1412:DOD:O	1.91	0.63
1:A:58:ILE:HD12	4:A:2041:HOH:O	1.93	0.63
1:A:3:PHE:HE1	4:A:1417:HOH:O	1.70	0.63
1:A:83:LEU:CD2	4:A:2041:HOH:O	2.38	0.62
1:A:40:THR:HG23	4:A:1486:HOH:O	1.90	0.62
1:A:17:LEU:CD1	4:A:2080:HOH:O	2.47	0.61
1:A:21:ARG:NH1	4:A:1311:DOD:O	2.33	0.60
1:A:9:ALA:CB	4:A:1389:HOH:O	2.37	0.60
1:A:3:PHE:CD1	4:A:1486:HOH:O	2.45	0.59
1:A:129:LEU:HD22	4:A:1485:HOH:O	1.75	0.59
1:A:123:TRP:CZ3	4:A:1445:HOH:O	2.55	0.59
1:A:33:LYS:CE	4:A:1444:HOH:O	2.49	0.59
1:A:25:LEU:HG	4:A:2022:HOH:O	1.86	0.58
1:A:124:ILE:HD13	4:A:2022:HOH:O	1.98	0.58
1:A:128:ARG:HG3	4:A:1256:DOD:O	1.98	0.58
1:A:91:SER:O	4:A:1418:HOH:O	2.20	0.54
1:A:66:ASP:HA	2:A:1130:NO3:O1	2.01	0.54
1:A:21:ARG:CD	4:A:1311:DOD:O	2.44	0.53
1:A:33:LYS:HE2	4:A:1444:HOH:O	2.05	0.52
1:A:92:VAL:CG2	4:A:2080:HOH:O	2.57	0.52
1:A:83:LEU:CG	4:A:2041:HOH:O	2.58	0.52
1:A:68:ARG:NH2	4:A:1240:DOD:O	2.44	0.51
1:A:107:ALA:CB	4:A:1411:HOH:O	2.46	0.50
1:A:56:LEU:HD11	4:A:2079:HOH:O	2.06	0.50
1:A:129:LEU:HD11	4:A:1389:HOH:O	2.07	0.49
1:A:28:TRP:HA	4:A:2076:DOD:O	2.08	0.49
1:A:28:TRP:HE3	4:A:2079:HOH:O	1.91	0.48
1:A:128:ARG:NE	4:A:1234:DOD:O	2.44	0.46
1:A:124:ILE:CG2	4:A:1389:HOH:O	2.64	0.45
1:A:5:ARG:NH2	4:A:1303:HOH:O	2.45	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:12:MET:HE3	4:A:2081:HOH:O	2.06	0.42
1:A:28:TRP:CE3	4:A:2079:HOH:O	2.61	0.42
1:A:28:TRP:HE3	4:A:2076:DOD:O	1.99	0.41
1:A:25:LEU:CD1	4:A:2023:HOH:O	2.33	0.40

There are no symmetry-related clashes.

4.3 Torsion angles [i](#)

4.3.1 Protein backbone [i](#)

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	127/129 (98%)	126 (99%)	1 (1%)	0	100	100

There are no Ramachandran outliers to report.

4.3.2 Protein sidechains [i](#)

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	105/105 (100%)	104 (99%)	1 (1%)	68	58

All (1) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	128	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	44	ASN
1	A	57	GLN

4.3.3 RNA [i](#)

There are no RNA molecules in this entry.

4.4 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

4.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

4.6 Ligand geometry [i](#)

Of 6 ligands modelled in this entry, 1 is monoatomic - leaving 5 for Mogul analysis.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
2	NO3	A	1349	-	1,3,3	0.25	0	0,3,3	-	-
2	NO3	A	1350	-	1,3,3	0.05	0	0,3,3	-	-
2	NO3	A	1132	-	1,3,3	0.66	0	0,3,3	-	-
2	NO3	A	1130	-	1,3,3	0.33	0	0,3,3	-	-
2	NO3	A	1151	-	1,3,3	0.21	0	0,3,3	-	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

2 monomers are involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	1130	NO3	1	0
2	A	1151	NO3	2	0

4.7 Other polymers [i](#)

There are no such residues in this entry.

4.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.